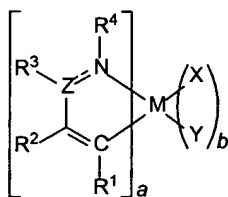


CLAIMS

What is claimed is:

1. An organic photosensitive optoelectronic device comprising:
an anode;
an active region comprising a cyclometallated organometallic material; and
a cathode,
wherein the device produces a photogenerated current when illuminated with light.
2. The organic photosensitive optoelectronic device of claim 1, wherein the cyclometallated organometallic material comprises an Ir or Pt atom.
3. The organic photosensitive optoelectronic device of claim 1, wherein the device further comprises a blocking layer.
4. The organic photosensitive optoelectronic device of claim 1, wherein the cyclometallated organometallic material has the formula I



(I)

wherein

M is a transition metal having a molecular weight greater than 40;

Z is N or C,

the dotted line represents an optional double bond,

R¹, R², R³ and R⁴ are independently selected from H, alkyl, or aryl, and additionally or

alternatively, one or more of R¹ and R², R² and R³, and R³ and R⁴ together from

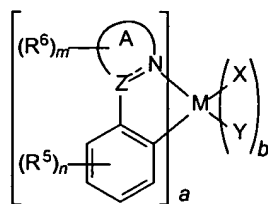
independently a 5 or 6-member cyclic group, wherein said cyclic group is cycloalkyl,

cycloheteroalkyl, aryl or heteroaryl; and wherein said cyclic group is optionally substituted

by one or more substituents Q;

each substituent Q is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF₃, NR₂, NO₂, OR, halo, and aryl, and additionally, or alternatively, two Q groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group;
 each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl;
 (X and Y), separately or in combination, are an ancillary ligand;
a is 1 to 3; and
b is 0 to 2;
 with the proviso that the sum of *a* and *b* is 2 or 3.

5. The organic photosensitive optoelectronic device of claim 1, wherein the cyclometallated organometallic material has the formula



wherein

M is a transition metal having a molecular weight greater than 40;
 ring A is an aromatic heterocyclic ring or a fused aromatic heterocyclic ring with at least one nitrogen atom that coordinates to the metal M;
 Z is selected from carbon or nitrogen;
 each R⁵ is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF₃, NR₂, NO₂, OR, halo, and aryl, and additionally, or alternatively, two R⁵ groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group;
 each R⁶ is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF₃, NR₂, NO₂, OR, halo, and aryl, and additionally, or alternatively, two R⁶ groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group;
 each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl;
 (X and Y), separately or in combination, are an ancillary ligand;
n is 0 to 4;

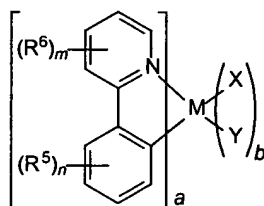
m is 0 to 4;

a is 1 to 3; and

b is 0 to 2;

with the proviso that the sum of a and b is 2 or 3.

6. The organic photosensitive optoelectronic device of claim 5, wherein the cyclometallated organometallic material has the formula



wherein

M is a transition metal having a molecular weight greater than 40;

ring A is an aromatic heterocyclic ring or a fused aromatic heterocyclic ring with at least one nitrogen atom that coordinates to the metal M;

each R^5 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^5 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group;

each R^6 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^6 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group;

each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl;

(X and Y), separately or in combination, are an ancillary ligand;

n is 0 to 4;

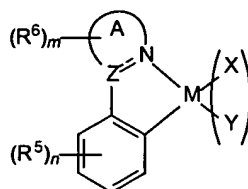
m is 0 to 4;

a is 1 to 3; and

b is 0 to 2;

with the proviso that the sum of a and b is 2 or 3.

7. The organic photosensitive optoelectronic device of claim 5, wherein the cyclometallated organometallic material has the formula IV



IV

wherein

M is a transition metal having a molecular weight greater than 40;

ring A is an aromatic heterocyclic ring or a fused aromatic heterocyclic ring with at least one nitrogen atom that coordinates to the metal M;

each R^5 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^5 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group;

each R^6 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^6 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group;

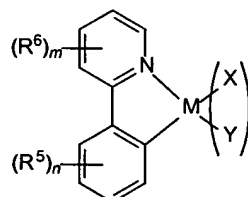
each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl;

(X and Y), separately or in combination, are an ancillary ligand;

n is 0 to 4; and

m is 0 to 4.

8. The organic photosensitive optoelectronic device of claim 7, wherein the cyclometallated organometallic material has the formula V



V

wherein

M is a transition metal having a molecular weight greater than 40;

each R^5 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^5 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group;

each R^6 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^6 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group;

each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl;

(X and Y), separately or in combination, are an ancillary ligand;

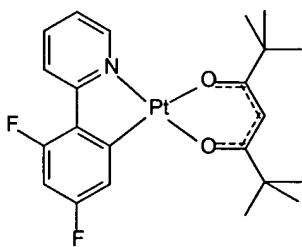
n is 0 to 4; and

m is 0 to 4.

9. The organic photosensitive optoelectronic device of claim 7, wherein M is Pt.

10. The organic photosensitive optoelectronic device of claim 7, wherein the cyclometallated organometallic material forms π -stacked chains.

11. The organic photosensitive optoelectronic device of claim 9, wherein the cyclometallated organometallic material has the formula



12. The organic photosensitive optoelectronic device of claim 1, wherein the cyclometallated organometallic material absorbs light in the red or near IR portion of the spectrum.

13. The organic photosensitive optoelectronic device of claim 1, wherein the device is a photovoltaic device.

14. The organic photosensitive optoelectronic device of claim 1, wherein the device is a photodetector.
15. The organic photosensitive optoelectronic device of claim 1, wherein the device is a photoconductor.
16. The organic photosensitive optoelectronic device of claim 1, wherein the device comprises multiple subcells in series.